Liquid Metals Chemistry and Physics, Sylvan Z. Beer, (ed.), Marcel Dekker, New York (1972). 731 pages. $35.00.

This book is aimed at a comprehensive review of the status of the subject matter which is just approaching maturity. As the editor states articles are presented largely in the form of summaries of the work done. However, they were written with the intent of combining reviews with original contributions and critical comments on various selected aspects of a very large field. Chemical engineers in general should be aware that this book is not a source of engineering data on liquid metals but a collection of subjects providing basic formalism and theory of metals and metallic alloys, predominately from the viewpoints of material scientists and physicists. It should become obvious that this book is different from the *Liquid Metals Handbook.* For similar reasons, there is no preferential treatment given to the alkali metals. (This remark is for those who might think that alkali metals and liquid metals were synonymous.)

A total of 15 chapters are presented, covering the subject of thermodynamic formalism, kinetics of evaporation, electric and optical properties, surface tension and viscosity, structure theory, diffraction analysis, sound propagation, magnetic properties, pressure effects, diffusion, electromigration, electronic nature and liquid metal theory, and noncrystalline metallic alloys. It embodies information useful to workers in a variety of fields such as air pollution, boiling liquid metals, magnetohydrodynamics, as well as diffraction and electromagnetic theories, general theory of susceptibility of metals, and pseudo potential theory of metals. With such a wide scope, it is difficult to expect that all areas could be treated with the same degree of thoroughness. This reviewer finds that the discussions of the relation between thermodynamic and electrical properties of liquid alloys and the kinetics of evaporation of various elements from liquid iron alloys under vacuum are quite interesting and comprehensive. On the other hand, this book also reveals areas that considerable development is still wanted, such as the diffusion phenomenon in liquid metals. The particular chapter on this subject is disappointingly short. Information on diffusion coefficients are often hard to find, but no suggestion in this respect is offered. In the overall arrangement of the book, it is commendable that amazingly little repetition exists despite the fact that different authors contribute to various chapters. One drawback, however, of the book appears to be the lack of nomenclature in each chapter.

Finally, a few statistics may be of interest. The source of information is so broad that many articles were originally published in foreign periodicals: 16% of references from UK, 10% from Russia, 14% from the rest of Europe, 3% from Asia, and the balance (57%) from the United States. In this broad collection of the related references, the growth rate of the literature in this field is also noteworthy: 28% of the references were published within the last five years, 34% between 1962 and 1967, and 38% a decade or more ago.

Y. S. Tang
Westinghouse
Advanced Reactors Division
Madison, Pennsylvania 15663

Physical Principles of Chemical Engineering, Peter Grassman, Pergamon Press, New York (1971). 896 pages. $48.00.

According to the author, this book is intended for physicists, physical chemists, and mechanical engineers, as well as chemical engineers. Its purpose is to provide a foundation on which they can all continue to build. The book, which is written at roughly the level of an upperclass engineering text, is a blend of basic ideas and techniques and the analysis of industrial equipment. While a knowledge of thermodynamics is assumed, a chapter on the concept and use of entropy is included.

There are chapters on standard chemical engineering topics such as principles of fluid dynamics, applications of fluid dynamics, heat, mass and momentum transport and rheology. The approach frequently relies on dimensional analysis and model theory, and a chapter on these topics is included. The equations of change are adequately presented and discussed; however, they do not occupy the central and unifying position that they do in the books by, for example, Bird, et al. or Slattery. On the other hand, many complex phenomena such as water hammer and bubble formation frequently ignored in basic works are considered.

The kinetic theory of gases and physics of solids are covered in two well-written chapters. Most chemical engineers will find the material on stress distributions and deformation of solids especially interesting and informative.

There are also chapters on materials with large surface area and multiphase flow. These are probably the most valuable parts of the book. The material is treated in a very general manner with helpful surveys at the beginnings of the chapters. Here, as in much of the book, the results of a great many investigators are presented and woven together to provide a description which extends from the basic concepts to the very complicated and largely empirical.

The final chapter (12) is intended as a summary. In actuality, a new series of topics ranging from reactor stability to theoretical plates to optimization are briefly examined. The material builds on the preceding portions of the book only in the sense that the concepts of heat and mass transfer, etc., are used.

Obviously the author has set an enormous task for himself. He has succeeded best at the extremes of the very basic, for example, kinetic theory of gases, and in those areas where exact analysis is difficult, atomization, for example. Anyone reading the book has to be impressed by the magnitude of the effort and the knowledge displayed. The author states in the preface that books should be written by a single individual. This one certainly was. At no place does one get the feeling that he is getting the standard treatment of a topic. Despite the size of the volume and the breadth of the coverage, the treatment is remarkably uniform. In summary, though the principles of transport phenomena are not as simply presented as they can be, the book frequently provides an alternative approach and occasionally real insight into complex phenomena.

John C. Matthews
Department of Chemical Engineering
Kansas State University
Manhattan, Kansas 66506

Catalysis Reviews, Vol. 6, H. Heinemann, Ed., Marcel Dekker, Inc., New York (1972). 341 pages. $19.50.

How does one review a book of reviews? This question needs an answer before we proceed. When I began reading this excellent compilation of research reviews I wondered who would study the entire book besides the editor and me. When I finished I was convinced that the breadth and quality of the papers was such that any newcomer to the field of catalysis would do well to read the book rather than selected portions. It would provide an excellent discussion base for a graduate seminar in catalysis; with this in mind the present review will address the individual papers in a different order than they appear in the book.

Two papers discuss the homogeneous catalysis of the *oxo* reaction. M. Orchin and W. Rupilius review the